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Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Core Network and Terminals;
IMS Restoration Procedures
(Release 11)

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[17] 3GPP TS 23.401: "GPRS Enhancements for E-UTRAN Access".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Service Interruption: A period of time in which one or more network elements do not respond to requests and do not send any requests to the rest of the system.

S-CSCF Restoration Information: Information required for the S-CSCF to handle traffic for a registered user. This information is stored in HSS and if lost, retrieved by the S-CSCF.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

LIR	Location Information Request
LIA	Location Information Answer
SAR	Server Assignment Request
SAA	Server Assignment Answer
UAR	User Authorization Request
UAA	User Authorization Answer

4 Restoration of Data in the S-CSCF

4.1 General

The following clauses describe the IMS Restoration Procedures for the S-CSCF service interruption in each of the scenarios where they apply.

4.2 Registration Procedure

4.2.1 Introduction

The following clauses specify the behaviour of HSS and S-CSCF if they support the IMS restoration feature.

4.2.2 S-CSCF Restoration after Failure

If the UE initiates a SIP REGISTER and the S-CSCF returned by the HSS during user registration status query procedure fails, the I-CSCF is unable to contact the S-CSCF. In this case, regardless of this registration is an initial registration, a re-registration or a de-registration, the I-CSCF shall send UAR with Authorization Type set to REGISTRATION_AND_CAPABILITIES to the HSS to explicitly request S-CSCF capabilities. After re-assignment of another S-CSCF according to the S-CSCF capabilities, the I-CSCF shall forward the REGISTER to the new S-CSCF. For registrations and re-registrations, S-CSCF shall proceed with the registration procedure as for initial registration, except for the clauses specified in 4.2.3.

For de-registrations, S-CSCF shall proceed as for user-initiated de-registration.

- if the Public User Identity is stored as registered in the HSS, and there are S-CSCF restoration information related to the Public User Identity stored in the HSS, the HSS shall send the S-CSCF restoration information together with the user profile in the SAA. The result code shall be set to DIAMETER_ERROR_IN_ASSIGNMENT_TYPE. The S-CSCF shall trigger matched registered services for the Public User Identity.

If there are more than one group of S-CSCF restoration information related to the Public User Identity, which may happen if the Public User Identity is shared by multiple Private User Identities, the HSS shall include all of the S-CSCF restoration information in the SAA. One group of S-CSCF restoration information corresponds to one Private User Identity.

If the S-CSCF restoration information received includes the UE's subscription information, the S-CSCF shall construct a NOTIFY message according to the information and send it to the UE (or UEs if the IMPU is shared between several IMPIs) to trigger a new registration at anytime after normal processing of the terminating request.

4.3.3 S-CSCF Restoration after Failure

If the S-CSCF returned by the HSS during location query procedure fails, the I-CSCF is unable to contact the S-CSCF during terminating procedure. In this case, the I-CSCF shall send LIR to the HSS to explicitly request S-CSCF capabilities. If the HSS returns the S-CSCF capabilities to the I-CSCF, after re-selection of another S-CSCF according to the S-CSCF capabilities, the I-CSCF shall forward the service request to the new S-CSCF. The HSS and this new S-CSCF shall behave as described in clause 4.3.2, except that the HSS shall overwrite the S-CSCF name when receiving the SAR request, only if there is a previous explicit LIR request for S-CSCF capabilities.

NOTE: If the HSS indicates during location query procedure that the server name returned corresponds to an AS, then the service request is for PSI direct routing. In this case, IMS Restoration Procedures will not be executed and I-CSCF will reject the service request.

4.4 UE Originating Procedure

4.4.1 Introduction

The following clauses specify the behaviour of HSS, S-CSCF and P-CSCF if they support the IMS Restoration feature.

4.4.2 S-CSCF Restoration after Restart

The S-CSCF lost all user data if it restarts after a failure or it is unable to trust any data after it resumes operation, due to the fact that it may have lost profile updates from the HSS in the service interruption period. If such a S-CSCF receives an originating request different from SIP REGISTER coming from the UE, the S-CSCF shall send SAR to the HSS with Server Assignment Type set to NO_ASSIGNMENT to restore the user data. If the S-CSCF name sent in the Server-Assignment-Request command and the previously assigned S-CSCF name stored in the HSS are different, which may happen if S-CSCF reassignment occurred during a terminating restoration before, the HSS shall not overwrite the S-CSCF name; instead it shall send a response to the S-CSCF with result code set to DIAMETER_UNABLE_TO_COMPLY, as specified in the 3GPP TS 29.228 [3]. If there are S-CSCF restoration information related to the Public User Identity stored in the HSS, the HSS shall send the S-CSCF restoration information together with the user profile in the SAA to the S-CSCF. If the HSS returns an error DIAMETER_UNABLE_TO_COMPLY to the S-CSCF, the S-CSCF shall then return a specific error response to the UE to trigger a new registration.

If there are more than one group of S-CSCF restoration information related to the Public User Identity stored in the HSS, which may happen if the Public User Identity is shared by multiple Private User Identities, the HSS shall include all of the S-CSCF restoration information in the SAA. One group of S-CSCF restoration information corresponds to one Private User Identity.

If the S-CSCF receives SAA with the service profile of the user, the S-CSCF shall continue the originating service as normal.

If the S-CSCF receives SAA with S-CSCF restoration information and the S-CSCF restoration information includes the UE's subscription information, the S-CSCF shall construct a NOTIFY message according to the information and send it

4.6.2 Backup and Update of S-CSCF Restoration Information during Registration Process

The S-CSCF shall backup the following data in the HSS during the initial registration process.

- the list of SIP proxies in the path (normally it would be just the P-CSCF address)
- the Contact Information (Contact Addresses and Contact Header parameters)
- the Authentication Information (SIP-Authentication-Scheme)

This is done with an additional information element in the SAR requesting user information, in addition to the basic set of information required to handle traffic, as specified in the 3GPP TS 29.228 [3]. The information is associated with the Private User Identity and the Implicit Registration Set that is affected by the SAR request. The HSS shall store this information.

If any of the above data is changed, the S-CSCF shall update it in the HSS using SAR request with Server-Assignment-Type set to RE_REGISTRATION and the User Data Already Available parameter set to USER_DATA_ALREADY_AVAILABLE, as specified in the 3GPP TS 29.228 [3].

4.6.3 Backup and Update of S-CSCF Restoration Information after UE's Subscription

If the S-CSCF receives the UE's subscription to notification of the reg-event for the first time, the S-CSCF shall send an SAR to the HSS to store the following UE's subscription information.

- Call-ID, From, To, Record-Route, Contact

To avoid frequent storing of the subscription information in the HSS, the CSeq should not be included in the S-CSCF restoration information. Instead, the CSCF shall ensure that subsequent notification after retrieving this data includes a sufficiently large Cseq value so that the UE is able to accept it.

This is done with Server Assignment Type set to RE_REGISTRATION and the User Data Already Available parameter set to USER_DATA_ALREADY_AVAILABLE in the SAR, as specified in the 3GPP TS 29.228 [3]. The information is associated with the Private User Identity affected by the SAR request. The HSS shall store this information.

If any of the above data is changed, the S-CSCF shall update it in the HSS using SAR request with Server-Assignment-Type set to RE_REGISTRATION and the User Data Already Available parameter set to USER_DATA_ALREADY_AVAILABLE, as specified in the 3GPP TS 29.228 [3].

The S-CSCF shall send the registration data together with the subscription data as one S-CSCF restoration information. Each time the HSS receives the S-CSCF restoration information related to the same Private User Identity in the SAR with Server-Assignment-Type set to RE_REGISTRATION, the HSS shall overwrite the previous S-CSCF restoration information.

5 Recovery after P-CSCF failure

5.0 General

The following clauses show the requirements and information flows of IMS Restoration Procedures for the P-CSCF service interruption in each of the scenarios where they apply.

Procedures over S9 between V-PCRF and H-PCRF are not supported in this release of the specification.

5.1 Update PDP context/Bearer at P-CSCF failure

These flows show the procedures performed by the network at P-CSCF failure after user initiated registration..